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CHEMICAL & ENGINEERING

NEWS

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ACS spring meeting, St. Louis
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Electrode surface modification

A new era for electrochemistry
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Cover: Photomicrograph of modified electrode in which Nafion, a sulfonated fluoropolymer, is coated onto tin oxide. Photo courtesy of Allen J. Bard and coworkers, University of Texas, Austin

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CHEMICAL & ENGINEERING NEWS

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News of the Week

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■ **Conference Board says current U.S. fiscal policies will lead to recession in 1985.** **Page 7**

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Update of 1982 report on science and national security indicates government is using stricter controls than recommended. **Page 15**

Technology

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French gasohol project will use lignocellulosic materials via a process developed by U.S. firm to make cattle feed. **Page 22**

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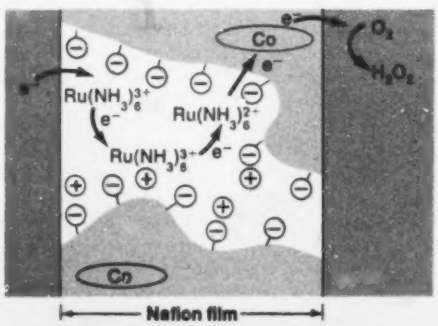

Special Report

Synthesis and application of microstructures on electrodes: promising area of chemistry. **Page 28**

Women, minorities make gains in science

"Despite substantial gains over the past decade, women and minorities are still underrepresented in science and engineering, both in employment and in training," says a new National Science Foundation report.

Between 1972 and 1982, employment of women scientists and engineers increased more than 200%, compared with about 40% for men. As a result, women accounted for 13% of the science/engineering workforce in 1982, the report says. During the same period, the employment of black scientists and engineers almost tripled, whereas the employment of whites rose 40%.

More women and members of minority groups are earning science or engineering degrees than a decade ago. But the report points out that these women and minorities "generally have higher rates of unemployment and lower average salaries than their counterparts." These differences may reflect a variety of factors, including fewer years of work experience, differences in career preferences, and inequitable treatment.

The report notes that "women and minority scientists and engineers who are employed are less likely to hold jobs in science and engineering, although more than 80% do hold such positions." In addition, women and blacks earn 10 to 20% less money than their male and white counterparts.

In 1982, blacks represented 2.6% of all employed scientists and engineers, but more than 9% of the total U.S. workforce. Asians, by contrast, accounted for 4.5% of the employed scientists and engineers, but only 1.6% of the overall U.S. labor force.

The report, "Women and Minorities in Science and Engineering," is the second in a biennial series mandated by public law to present information on the participation of women, racial and ethnic minority group members, and the physically handicapped in science and engineering. Copies of the report (NSF 84-300) are available from the Division of Science Resources Studies, NSF, 1800 G St., N.W., Washington, D.C. 20550; phone (202) 634-4691. □

Employed chemists: men outnumber women . . .

Per cent	Men	Women
All races	86%	14%
White	88	12
Black	43	57
Asian	75	25

. . . but larger share of women are black

Per cent	Men	Women
White	93%	77%
Black	2	13
Asian	4	8

Note: Preliminary data for 1982, subject to revision.
Source: National Science Foundation

Ozone depletion may be less than thought

Better mathematical models and more accurate field measurements have lowered the predicted effect of man-made gases on stratospheric ozone, according to a report prepared for the Environmental Protection Agency by a committee of the National Research Council. Models of the effect of continued release of chlorofluorocarbons into the atmosphere now predict a reduction in stratospheric ozone in the range of 2 to 4% by late in the next century, the committee says. In 1982 an equivalent National Research Council committee predicted a decrease of 5 to 9%, and in 1977 the predicted decrease was 15 to 18%.

Depletions of stratospheric ozone are important because this ozone layer shields Earth from most of the ultraviolet radiation coming from the sun. When the ozone layer is depleted, more ultraviolet radiation reaches the planet's surface, where it is believed to cause increases in human skin cancers, damage plant life, and possibly affect the global climate. Concern about ozone depletion led in 1978 to a ban on almost all uses of chlorofluorocarbons in aerosols in the U.S.

The principal factor responsible for the revision of the predicted ozone depletion has been improved measurements of photochemical rate parameters, the NRC committee says. Studies that use significantly improved measurement techniques have reduced uncertanties and led to revisions in many of these parameters in the past two years. Most of the revisions have led to lower predictions of ozone depletion.

The committee also finds that the more carefully the effects of man-made gases on the ozone layer are studied, the more complicated the problem is seen to be. Studies of the past two years have shown, for example, that there is not a "background" chemical composition of the atmosphere that can be considered to be unchanging in attempting to assess the effect of changing chlorofluorocarbon concentrations. Molecules besides chlorofluorocarbons also are steadily increasing in the atmosphere, including nitrous oxide (N_2O) and methane, and these changes influence the effect of chlorofluorocarbons. Thus models that consider only the effect of changes in chlorofluorocarbon concentration may not show what is really happening in the atmosphere.

Another factor that may be important is that ozone's photochemistry is not the same at different levels even within the stratosphere. Early predictions focused on the changes in ozone concentration predicted for the upper stratosphere (near 40 km), and those calculations have not changed substantially in the past decade. But newer models that take into account changes in other chemical species find that some of these effects are canceled out by increases in the ozone in the lower stratosphere.

Under some scenarios, present models even predict that the lower-level changes might more than cancel out the changes in the upper stratosphere, and total ozone concentrations may increase slightly over the next century. But ozone's chemistry in the lower stratosphere is not nearly so well understood as it is in the upper stratosphere. Three-dimensional models, which have yet to be developed, will be needed to understand this lower region's chemistry, the committee says. □

Update on Science and National Security Report Finds Little Change

Government has yet to relax controls on disseminating basic research results as recommended in the original Corson report

It has been almost a year and a half since the National Academy of Sciences released its report on Scientific Communication & National Security. Although since then incidents have been reported of papers being withdrawn from technical meetings because of Department of Defense objections, matters for the most part have remained calm. That little indeed has happened since the report was issued is shown in an update prepared by two of the staff members, Mitchell B. Wallerstein and Lawrence C. McCray, who worked on the original report. (Both are now on the NAS staff, but their report is not an official one.)

The earlier Corson report, named after study chairman Dale R. Corson, president emeritus of Cornell University, assessed the costs and benefits of government attempts to block communication of basic and sometimes applied research on militarily useful technologies from the Soviets. It generally concluded that the "limited and uncertain benefits" of controls are "outweighed by the importance of scientific progress." That conclusion and the report's 15 specific recommendations were generally endorsed by government agencies.

However, in preparing their update, Wallerstein and McCray found that "the government has not found it possible to act in a manner compatible with the major Corson report principles. In particular, although the government has apparently accepted the report's conclusion that the best form of control is the research funding contract, both the stringency and substantive reach of restrictions now proposed or in force go considerably beyond what was recommended in the report."

For example, the Department of Defense now has a 60-day prior review requirement for sensitive 6.1 (basic) research that is more restrictive than recommended by the Corson panel, which called for simultaneous review by the publisher and DOD. Its 90-day prior review and right to require changes in sensitive 6.2 (nonbasic) research also are far more restrictive than the Corson panel, which did not distinguish between 6.1 and 6.2 research in its recommendations.

It is somewhat reassuring that the update finds no known examples since 1982 in which Export Administration Act regulations actually have been invoked to prevent the dissemination of basic research results. However, the update finds "recent indications that draft technical data regulations under consideration for incorporation into [Export Administration Act regulations] would dramatically alter this situation by removing the general licensing exemption granted to 'scientific and education data.' They would require a validated license for the export of virtually all 'critical technical data.' "

Since, as the update points out, the definition of export includes such things as presentation of papers at symposia where foreigners are present and the hiring of foreign researchers, the proposed regulations have the potential for significantly affecting U.S. scientific enterprises. A lot will depend on just how "critical technical data" are defined.

Universities do very little sensitive research for the government

	Number of reports	Classified, %	Limited, %	Public, %
DOD labs	61,694	12 %	44 %	44 %
Industry	32,806	21	35	44
Universities	23,119	1.3	3.5	95.2
Nonprofit	5,609	17	15	68
TOTAL	123,328	13 %	33 %	54 %

Note: Research reports generated for Department of Energy, Department of Defense, and National Aeronautics & Space Administration.

In 1982 very little was known about the extent to which military research is classified or restricted in some other way. That situation has been remedied by an internal DOD steering committee that looked at the frequency with which reports in the Defense Technical Information Center, the Department of Energy's Technical Information Center, and the National Aeronautics & Space Administration Scientific & Technical Information Center were classified.

According to the update, analysis of the data supported the contention that universities are responsible for less sensitive research than that done in other settings, no matter what field of technology is involved. University-originated reports accounted for about 19% of the 123,328 DOD-sponsored reports in the study; only 1.3% were classified and only 3.5% had any distribution limitations. Every classified report and about 50% of the limited reports were generated in off-campus facilities affiliated with universities. An additional 3% of the limited reports from on-campus projects were judged to be restricted primarily to protect a university's

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proprietary interest. (None of the 4042 chemical research reports identified in the study were classified, and only 14% had a limited distribution.)

One of the Corson report's major recommendations deals with the need to develop a reliable database on which to base a net assessment of the damage to U.S. security from losses occurring through open scientifc communication. There has been little activity in that area. Based on recent intelligence briefings, the update's authors say that "it appears that no major initiatives have been undertaken to characterize better either the overall leakage problem (for example, the relative importance of various sources, channels, and types of information) or the relative significance of scientific information within the larger picture."

More successful have been the Corson report's recommendations concerning the need for more channels of communication between the government and the scientific research community to help alleviate problems arising from ignorance of each other's mindset and working environment. For example, within NAS, a high-level government-industry-academia roundtable has been established to facilitate communication, and an academic panel is being established to advise the State Department on visa approval, denial, or conditionality for scientific visitors from potential adversary countries.

Overall, the update concludes that "for most aspects of the technology transfer problem, we seem to have moved from a period of public controversy to a more subdued period of policy development and implementations. . . . There is little doubt that one useful development since the Corson panel was established has been an enhanced ability to distinguish between the general problem of unwanted technology transfer from all sources and those aspects which pertain to the open communication of scientific information. Despite the possibility of increased targeting in the future, unclassified scientific communication continues at present to be a small part of the overall problem."

Janice Long, Washington

Federal Alert—new legislation

This C&EN listing highlights legislation introduced between Jan. 23 and Feb. 9. Senate and House bills are listed under subject area by bill number, primary sponsor, and committee(s) to which referred.

SENATE

Environment. S. 2215—Glenn (D.-Ohio). Requires reduction in sulfur dioxide emission of 8 million tons per year in 31-state region of eastern U.S. by no later than Jan. 1, 1996, imposes 3 mill-per-kwh fee on fossil-generated electricity to help finance emission controls; referred to Environment & Public Works.

S. 2291—Humphrey (R.-N.H.). Allows EPA access to all remaining funds in hazardous substances response trust fund, rather than just the $410 million appropriated for 1984, limits liability of municipalities for cost of cleaning up municipally owned sites to no more than 50%; referred to Environment & Public Works.

Lobbying. S. 2251—Durenberger (R.-Minn.). Restricts use of federal funds by contractors and grantees with respect to costs knowingly incurred in direct support of "influencing legislation" but exempts activities such as providing technical advice and assistance to governmental officials; referred to Governmental Affairs.

Metric. S. 2223—Pell (D.-R.I.). Requires President's science adviser to undertake comprehensive, one-year study of current status of metric use in U.S.; referred to Commerce, Science & Transportation.

HOUSE

Authorization. H.R. 4797—Fuqua (D.-Fla.). Sets NASA's fiscal 1985 R&D budget ceiling at $2.4 billion; referred to Science & Technology.

Engineering. H.R. 4822—Brown (D.-Calif.). Changes NSF's name to National Science & Engineering Foundation; referred to Science & Technology.

Environment. H.R. 4760—Moody (D.-Wis.). Requires EPA to publish notices of release of hazardous substances from federal facilities, enter into cleanup agreements with the responsible agency that include specific cost estimates of actions to be taken; referred to Energy & Commerce, Public Works & Transportation.

H.R. 4813—Florio (D.-N.J.). Makes the $1.6 billion Superfund permanent, adds $1.8 billion annually to fund for five years by expanding number of basic feedstock chemicals subject to the tax, plus placing a tax on waste brought to disposal facilities; referred to Energy & Commerce.

Trade. H.R. 4590—Derrick (D.-S.C.). Establishes by statute a Committee for the Implementation of Textile Agreements; referred to Ways & Means.